

Claims

What is claimed is:

- 5 1. A motor driver circuit comprising:
an H-switch circuit arranged for connection with one phase of a multi-phase step
motor;
a switch driver interconnected with said H-switch and a bridge control circuit; and
a set point generator connecting with said bridge control circuit and said H-switch
10 circuit for removal of excess phase current from said multi-phase step motor.
- 15 2. The motor driver circuit of Claim 1 including a pair of operational amplifiers and a
pair of comparators interconnected together and with said bridge control circuit, said
operational amplifiers being connected with said H-switch in feed back circuit
arrangement.
- 20 3. The bridge control circuit of Claim 2 further including a phase current sensing
resistor connecting with inputs to said operational amplifiers for providing a sensing
current value to said operational amplifiers.
- 25 4. The bridge control circuit of Claim 2 wherein an output of one of said comparators
connects with said bridge control circuit to provide a forward current to said bridge
control circuit.
- 30 5. The bridge control circuit of Claim 2 wherein an output of another of said
comparators connects with said bridge control circuit to provide a reverse current to
said bridge control circuit.
6. The bridge control circuit of Claim 1 including means connecting between said set
point generator and said bridge control circuit for providing a sign current value to
said bridge control circuit.

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7. The bridge control circuit of Claim 1 wherein said H-switch circuit includes a pair of upper switches and a pair of lower switches, wherein said one phase of said multi-phased stepper motor is connected in parallel with upper and lower switches.
8. The bridge control circuit of Claim 1 including a PWM oscillator connecting with said set point generator and said bridge control circuit for providing a test current value to said bridge control circuit.
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9. The bridge control circuit of Claim 8 wherein said PWM oscillator further provides PWM oscillator timing value to said bridge control circuit.
10. The bridge control circuit of Claim 1 further including a step input to said set point generator for providing a set point current value to said set point generator.
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11. The bridge control circuit of Claim 8 further including a max time circuit connecting with said PWM oscillator and said bridge control circuit for providing a maximum on time value to said PWM bridge control circuit.
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12. The bridge control circuit of Claim 10 wherein said set point generator provides a wave front slope value to said PWM oscillator.
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13. A method for removing excess phase current from a stepper motor comprising the steps of: determining an amount of current in one phase of a multiphase stepper motor;
comparing the one phase motor current to a predetermined test current value; and
reversing direction of the one phase motor current to reduce the one phase motor current to the test current value.
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14. The method of Claim 13 including the steps of determining amounts of current in remaining phases of a multiphase stepper motor;

comparing the remaining phases motor currents to a predetermined test current value; and
reversing direction of the remaining phases motor currents to reduce the remaining
5 phases motor currents to the test current value.

15. A method for controlling phase current in a stepper motor comprising the steps of:
determining the pulse width modulation frequency to control current in one phase of
a multi-phase stepper motor;
10 determining an appropriate pulse width modulation frequency; and
adjusting a pulse width modulation frequency for the one phase current to a value
less than said maximum pulse width modulation frequency.

15 16. The method of Claim 15 including the steps of: determining pulse width modulation
frequencies for controlling current in remaining phases of a multi-phase stepper
motor;
determining an appropriate pulse width modulation frequency; and
adjusting the remaining phases pulse width modulation frequencies to a value less
20 than said maximum pulse width modulation frequency.

17. A method for limiting the maximum charge / discharge time of the current in one
phase of a multi-phase step motor.
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18. The method of claim 17 including the steps of: limiting the maximum charge /
discharge time of the currents in remaining phases of a multi-phase stepper motor.